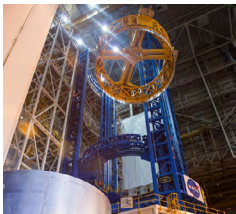




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Marshall Center Recognizes National Energy Awareness Month

Small steps can add up to a long journey of cost and energy savings.

October is National Energy Awareness Month and NASA's Marshall Space Flight Center is encouraging team members to reduce energy use and prevent the waste of electricity.

"Minor changes to daily routines can add up to huge energy savings over time," said Rhonda Truitt, an energy

engineer with Parsons Engineering supporting the Marshall Center Facilities Management Office. "For example, if each employee helped save only one kilowatt hour every day, our costs would be reduced by \$180,000 per year."

Since energy and water conservation plans were enacted more than 20 years ago, NASA has estimated that its annual utility bill would currently be \$20 million higher had it not

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Interactive Destination Station Technology Forum Coming to Huntsville on Oct. 27

By Bill Hubscher

NASA experts will answer questions about technologies being demonstrated on the [International Space Station](#) during "Destination Station: ISS Technology Forum" at the [U.S. Space & Rocket Center's Davidson Center for Space Exploration](#) on Oct. 27 from 8:45 to 10 a.m.

The Destination Station forums are a series of live, interactive panel discussions about the space station

that are broadcast on [NASA-TV](#). This -- the second in the series -- features agency technologists discussing how technologies are tested on the unique orbiting laboratory. Thousands of investigations have been performed on the station, and while they provide benefits to people on Earth, they also prepare NASA to send humans farther into the solar system than ever before.

Participants must be seated at the

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Work Begins on a Welding Wonder for Space Launch System

A ring and barrel recently were loaded onto the Vertical Assembly Center at NASA's Michoud Assembly Facility. The tool, one of the largest in the world, will join domes, rings and barrels to complete the tanks or dry structure assemblies for the core stage of NASA's Space Launch System. The tool also will perform nondestructive evaluation on the completed welds. These are the first confidence welds performed on the tool, which ensures it works as it is designed to do before welding actual flight hardware.

SLS will be the most powerful rocket ever built for deep space missions, including to an asteroid and ultimately to Mars. The core stage, towering more than 200 feet tall (61 meters) with a diameter of 27.6 feet (8.4 meters), will store cryogenic liquid hydrogen and liquid oxygen that will feed the vehicle's RS-25 engines. NASA's Marshall Space Flight Center manages the SLS Program for the agency. (NASA/Michoud)



Energy Awareness Month *Continued from [page 1](#)*

enacted its program.

Here are some ways employees can help conserve energy:

- Make sure lights are off when your office is unoccupied and especially when you leave for the day. Lighting accounts for more than 10 percent of total energy usage.
- Opening window blinds can help illuminate a room and heat it, too. Let natural light in to help keep occupants warm on sunny winter days.
- When possible, use break room refrigerators and use desk fans only when necessary. Small office appliances, including mini-refrigerators, desk fans and computer speakers, account for 30 percent of energy use in individual offices.
- Energy Star appliances use approximately 20 percent less energy than standard appliances. If personal refrigerators are approved for your building and you must use one, be sure its

Energy Star certified.

- Turn computers and related computer equipment off at night, on weekends, vacations and holidays.
- Electronics plugged into wall outlets use energy, even when they are not operating or charging. This includes cell phones and coffee pots. Turn off individual printers at your desk when not in use.

In fiscal year 2014, the Marshall Center surpassed its goals for reducing energy usage by 3 percent each year or 30 percent by fiscal year 2015 as specified in the [Strengthening Federal Environmental, Energy, and Transportation Management executive order](#). Improvements to air conditioning systems in existing buildings, upgraded lighting, and the construction of new “green” buildings all contributed to meet the goal. Employees are urged to help continue this positive trend by using the energy savings suggestions listed above.

Johnson Space Center Director Dr. Ellen Ochoa Speaks at Hispanic Heritage Event at Marshall Center

Dr. Ellen Ochoa, director of [NASA's Johnson Space Center](#), discusses her spaceflight experience and educational background with more than 400 people at the Hispanic Heritage Event on Oct. 7 at NASA's Marshall Space Flight Center. Ochoa was NASA's first Hispanic female astronaut, flying four missions to space. The Marshall Center and Team Redstone sponsored the event. (NASA/MSFC/Emmett Given)



From left, [Dr. Ellen Ochoa](#) discusses 3D printing technology with Niki Werkheiser, 3D printing in Zero-G project manager at the Marshall Center. NASA's first 3D printer, [tested at Marshall](#), was recently launched to the [International Space Station](#). (NASA/MSFC/Emmett Given)

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event by 8:30 a.m. in the Davidson Center theater at the Space & Rocket Center – the official visitor information center for [NASA's Marshall Space Flight Center](#). Forum panelists and exhibits will focus on space station environmental and life support systems, 3-D printing, space communications and navigation systems, and micro satellites.

The forum's panelists include:

- James Reuther, NASA's deputy associate administrator for Space Technology
- Robyn Gatens, manager for ISS System & Technology Demonstration and an expert on Environmental Control Life Support Systems
- Andres Martinez, project manager for the Synchronized Position Hold, Engage, Reorient, Experimental Satellites (SPHERES)

- Rich Reinhardt, principal investigator for the Space Communications and Navigations Testbed (SCaN)
- Niki Werkeiser, project manager for the ISS 3-D printer

During the forum, questions will be taken from the audience including the media, students and social media participants. Anyone unable to attend the event in person may ask questions via Twitter using #asknasa.

For NASA-TV streaming video and scheduling information, visit [here](#).

Hubscher, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Suspected Black Hole Unmasked as Ultraluminous Pulsar

An Ultraluminous X-ray Source that astronomers had thought was a black hole is really the brightest pulsar ever recorded. ULXs are objects that produce more X-rays than most “normal” X-ray binary systems, in which a star is orbiting a neutron star or a stellar-mass black hole. Black holes in these X-ray binary systems generally weigh about five to 30 times the mass of the sun.

Astronomers used NASA’s Nuclear Spectroscopic Telescope Array and Chandra X-ray Observatory to study two ULXs in the center of M82, a galaxy located just over 11 million light years from Earth. This composite image shows X-rays from NuSTAR (purple) and Chandra (blue) that have been combined with optical data from the NRAO 2.1-meter telescope (gold). The extended X-ray emission is unrelated to the two ULXs.

Until now, astronomers have thought that matter falling onto black holes powered the bright X-ray emission in all ULXs. Most of the black holes in ULXs are thought to weigh at least 10 to 50 times the mass of the sun, but some of the brightest ULXs are thought to weigh 100 times the sun’s mass, or more.

The new X-ray data provide a critical clue to the nature of one of the ULXs in M82. Using NuSTAR, scientists have discovered regular variations, or “pulsations,” in the object known as M82X-2. This object pulses once on average every 1.37 seconds and pulsations change in a regular pattern with a period of 2.5 days.

These types of pulsations are not seen with black holes. Rather, they are the signatures of so-called pulsars, rapidly rotating neutron stars. The apparent shifts in the pulsation period are due to the motion of the star in its orbit. Assuming that the pulsar weighs 1.4 times the mass of the sun (the common size of a pulsar or neutron star), the data imply that the companion star’s mass is at least 5.2 times the mass of the sun.

This discovery is significant because it may mean that pulsars make up a significant part of the ULX population. Chandra had observed M82X-2 before but these pulsations were not found until observations were made by NuSTAR, a high-energy X-ray mission that was launched in 2012. While NuSTAR detected the pulsations, Chandra, with its excellent spatial resolution, was needed to resolve M82X-2 from the other nearby ULX and rule out the contributions from other possible sources unresolved by NuSTAR.



(X-ray: NASA/CXC/Univ. of Toulouse/M. Bachetti; Optical: NOAO/AURA/NSF)

In addition to the pulsations, the overall brightness in X-rays of M82X-2 is variable over timescales lasting weeks and months. At its brightest it is more than 10 times brighter than any known pulsar that is powered by accretion of material from a companion star. It is so bright that generally astronomers thought that only 50 to 100 solar mass black holes could explain such a bright ULX.

The latest study of M82X-2 provides new challenges for theorists to develop models explaining how a pulsar can pull matter inward and produce such copious X-rays. When matter is pulled toward a dense, compact object like a pulsar, neutron star or black hole, it is heated and produces X-rays. These X-rays create a radiation pressure that pushes out on the matter. For sustained infall of matter, the radiation pressure of the X-rays should be less than the pull of the compact object’s gravity.

The X-ray luminosity of M82X-2 reaches about 100 times brighter than the threshold where the outward pressure from radiation balances the inward pull of gravity of the pulsar, the so-called Eddington limit. Possible explanations for violations of the Eddington limit include geometrical effects arising from the funneling of infalling material along magnetic field lines.

NASA’s Marshall Space Flight Center manages the Chandra program for NASA’s Science Mission Directorate. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra’s science and flight operations.

2015 Sample Return Robot Centennial Challenge is Open for Registration

By Janet Sudnik

Robotics teams are invited to register for the fourth running of the NASA Centennial Challenges program's Sample Return Robot Challenge, which will take place June 8-13, 2015. The autonomous robot competition, which carries a prize purse of \$1.5 million, will be held at Worcester Polytechnic Institute in Worcester, Massachusetts, which has hosted the event since 2012.

The teams must demonstrate a robot that can locate and collect geologic samples from a wide and varied landscape without human control in two levels of competition that increase in difficulty. Innovations stemming from this challenge may improve NASA's capability to explore a variety of destinations in space, as well as enhance the nation's robotic technology for use in industries and applications on Earth.

Since its inception, more than 20 teams from the United States and around the globe have competed in the event, and improvements in their entries are evident. Student groups, small companies and individuals have comprised past teams.

"The teams' robots are growing more sophisticated each year," said Sam Ortega, program manager for Centennial Challenges at NASA's Marshall Space Flight Center. "It's exciting to watch them overcome the significant obstacles of this challenge and make giant leaps toward developing a new technology."

At the inaugural competition event in 2012, no teams were awarded prize money because the challenge objectives were not met. During the 2013 competition, NASA awarded \$5,000 to Team



From left, Ahti Heinla and Sulo Kallas, both from Estonia, prepare team Kuukulgur's robot during the 2014 NASA Centennial Challenges Sample Return Robot Challenge held in June. This year was Kuukulgur's second attempt at winning the challenge. The 2015 competition is open for registration. (NASA/Joel Kowsky)

Survey of Los Angeles for completing Level 1 of the challenge. The West Virginia Mountaineers team from Morgantown was awarded \$5,000 in 2014 for their completion of Level 1. Both Team Survey and the Mountaineers will be eligible to begin the 2015 competition in Level 2, bypassing Level 1 if they choose.

Teams interested in learning more about the Sample Return Robot Challenge can visit [here](#).

Sudnik, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.